

# NASA SBIR/STTR Technologies

## Non-Toxic Ionic Liquid Fuels for Exploration Applications

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**SBIR**  
**STTR**

### Identification and Significance of Innovation

Replacing the highly toxic vintage hypergols currently used would significantly decrease risk and cost in propulsion systems. The objective of this Phase I program was to develop families of non-toxic ionic liquid fuels to be hypergolic with NTO and with LOX. These non-volatile, dense liquids should essentially match MMH in performance and offer substantial safety and cost savings benefits.

Estimated TRL : 1 → 2



*Non-Toxic Storable Propellants*

### Technical Objectives and Work Plan

In the Phase I work, ORBITEC demonstrated the feasibility of developing new, non-toxic ionic liquid fuels for propulsion applications. This work involved the following tasks:

- Synthesized 13 viable ionic liquid fuel candidates
- Tested the thermal stability at high temperature
- Measured the ignition delay of the samples: **two fuels ignited with nitric acid in ~ 5 ms**
- Predicted ideal performance of the fuels
- Analyzed integration into propulsion systems
- Laid plans for future transition of the technology and commercialization

### NASA and Non-NASA Applications

The end result of this research program will be a set of fuels that are simultaneously high performance and non-toxic. These fuels will have application for not only in NASA's propulsion systems but also in a range of military aerial warfare and tactical surface systems, missile defense, and commercial launch systems.

#### Firm Contacts

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**NON-PROPRIETARY DATA**